Current Hot Cell Monitor Status

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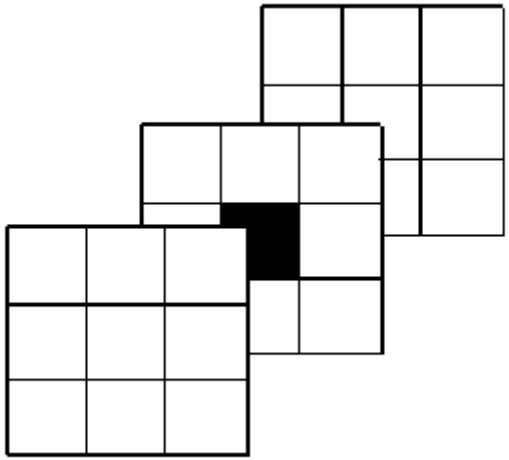
2 Hot Cell Finder Algorithms

- Threshold counter
  - Plots energy, cell location for all cells above threshold
  - Two (tuneable) thresholds: 1 GeV and 15 GeV

- NADA (Neighborless Anomalous Deposit Algorithm)
  - Used by D0
  - Candidate hot cell energy is compared to total energy in surrounding cells

NADA Details

- Check that candidate cell has energy > E_{cand}
- Sum energy in cube of nearest-neighbor cells in η, ϕ, and depth
  - Cells must have energy > E_{cell}
- If total energy < E_{cube}, then cell is identified as hot



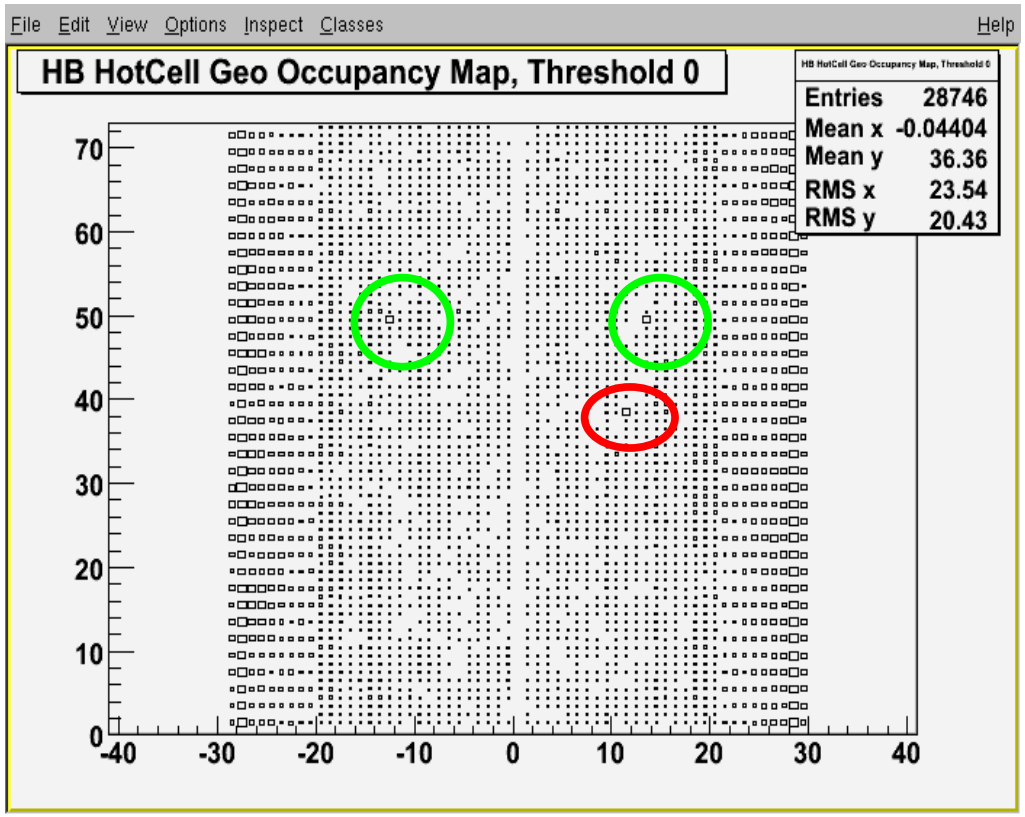
Parameters in blue are tuneable from the HcalMonitorModule.cfi file

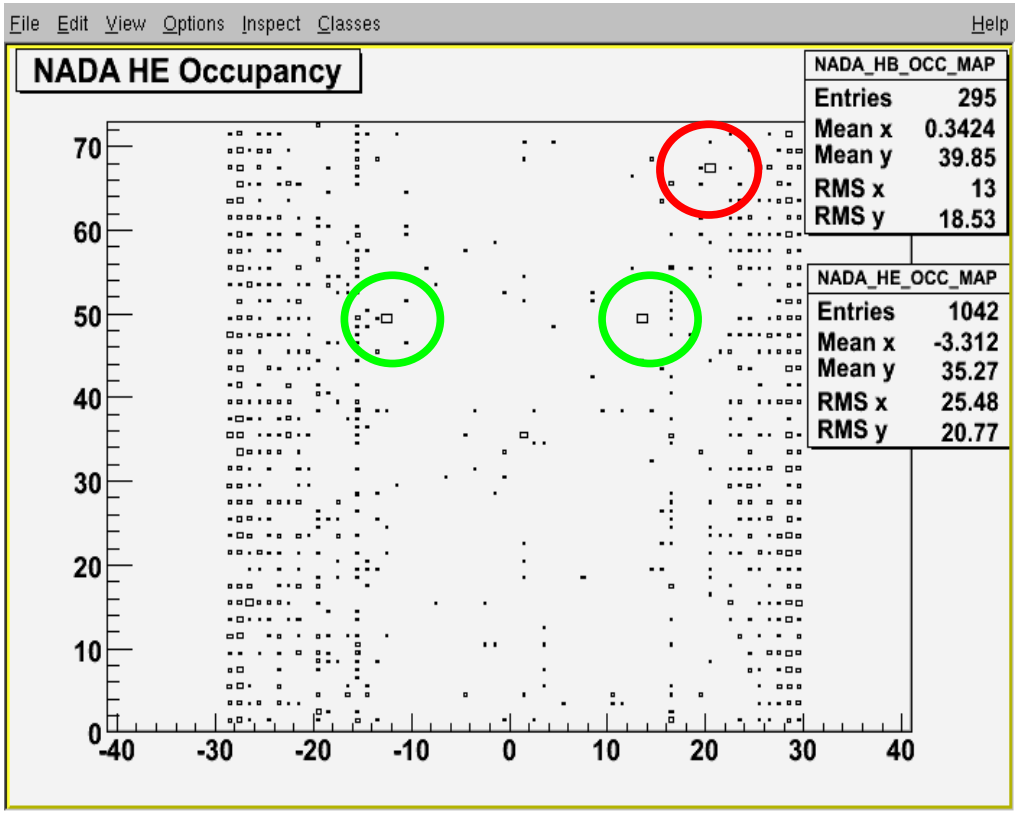
NADA Parameters

	negative E_T	low positive E_T	high positive E_T	very high E_T
E_T range	$E_T^{cand} < -1$ GeV	$1 \text{ GeV} < E_T^{cand} < 5$ GeV	$5 \text{ GeV} < E_T^{cand} < 500$ GeV	$500 \text{ GeV} < E_T^{cand}$
E_{cut}^{cell}		100 MeV	$0.020 \times E^{cand}$	
E_{cut}^{cube}		100 MeV	$0.020 \times E^{cand}$	
identify	always hot cell	hot cell if $E_i^{cell} > E_{cut}^{cell}$, $E^{cube} < E_{cut}^{cube}$	hot cell if $E_i^{cell} > E_{cut}^{cell}$, $E^{cube} < E_{cut}^{cube}$	always hot cell

- Values are default D0 parameters
- All are mutable with .cfi file

HBHE Hot Cell Finder on Sim QCD





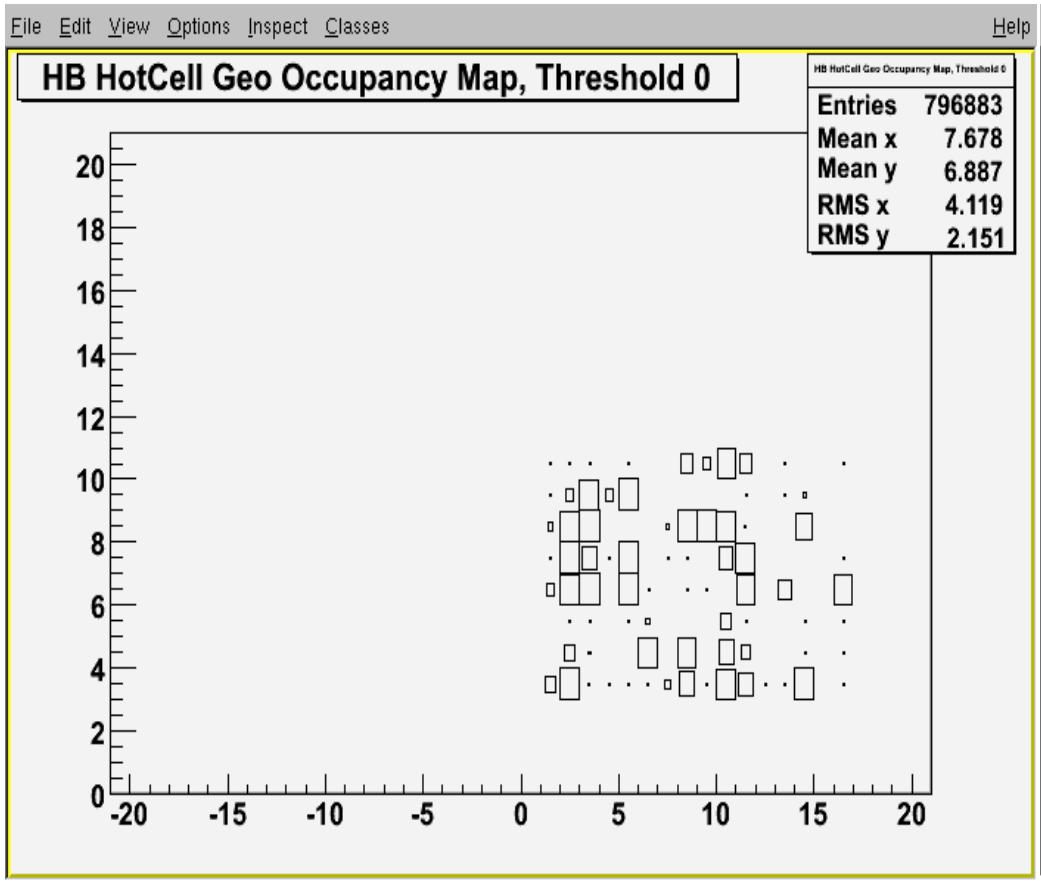
- See agreements and disagreements between algorithms
- Use different thresholds in different regions?

Hot Cell Finder on Real Data

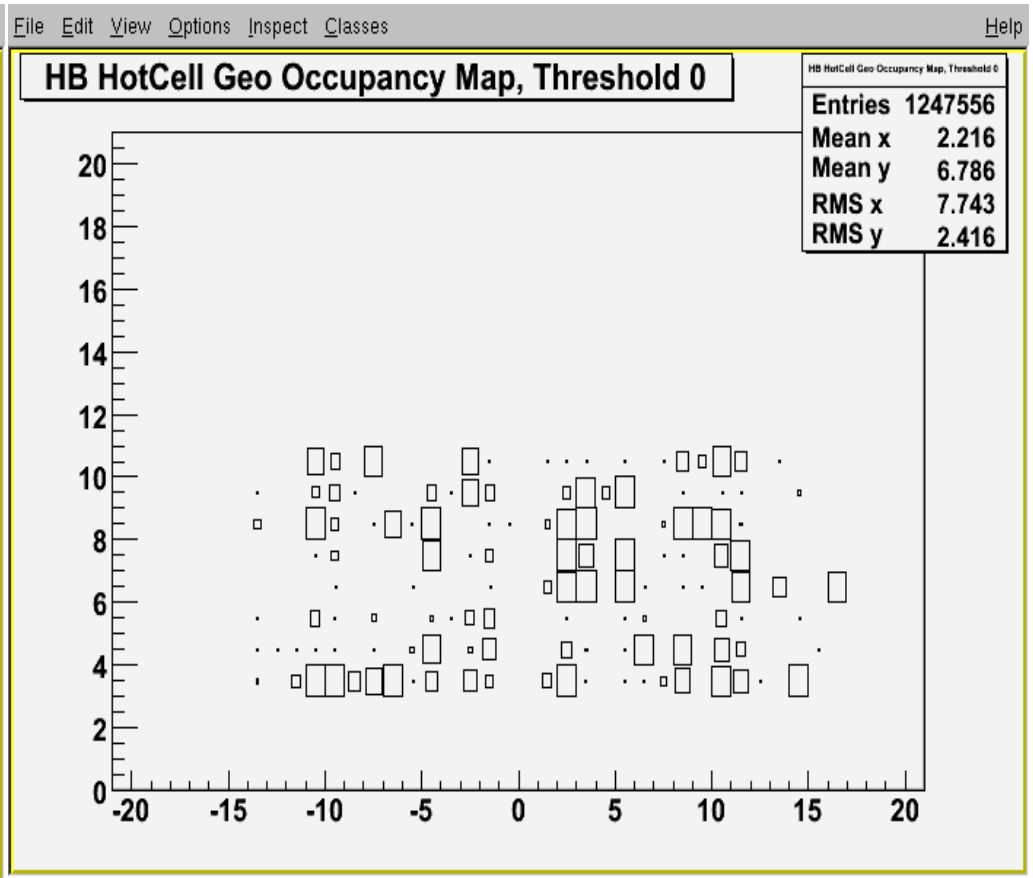
- From logbook entries https://cmsdaq.cern.ch/elog/HCAL/2651:
- Light-leak runs in HB:
  - 23003: HB+ sections 2,3
  - 23061: covered HB+ section 2
  - 23340: LV, HV on for HB+ sections 2,3 and HB- section 3. HB- section 3 covered
  - 23375: HB- section 3 uncovered; light leak appears fixed
  - 23475: HP+ sections 2,3; HP- sections 2,3. All layers covered

Threshold Hot Cell Finder

- Plot cells with E>1 GeV
- No cells seen with E> 5 GeV

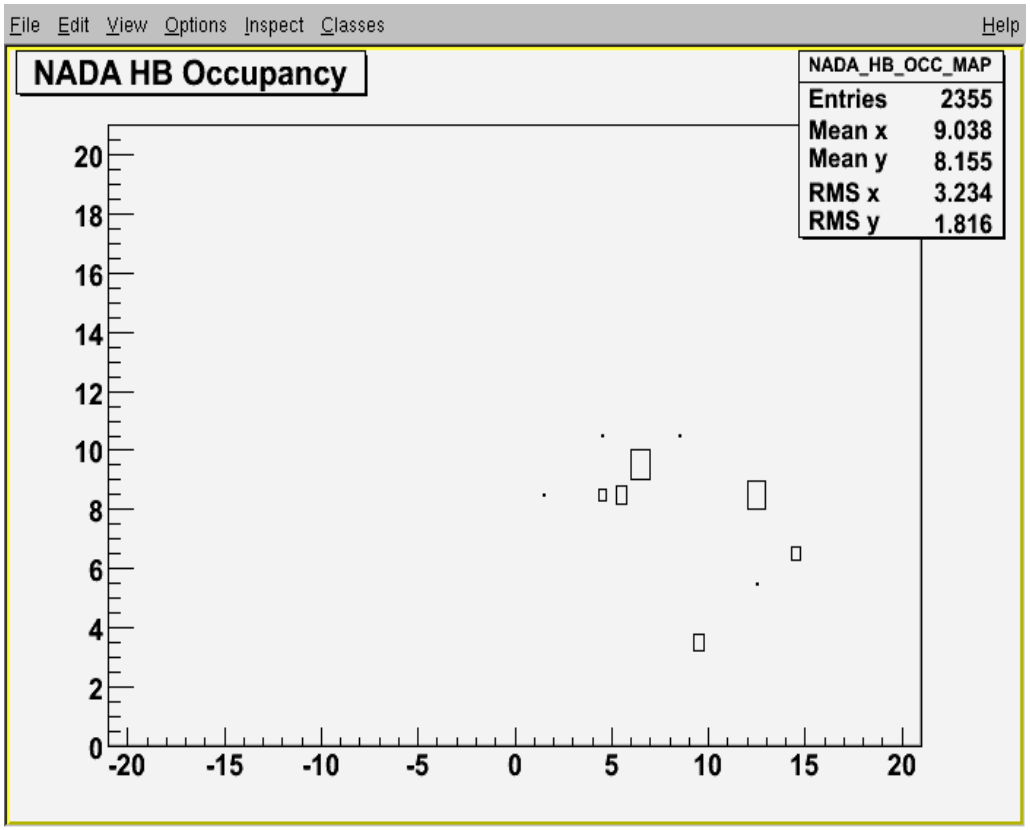


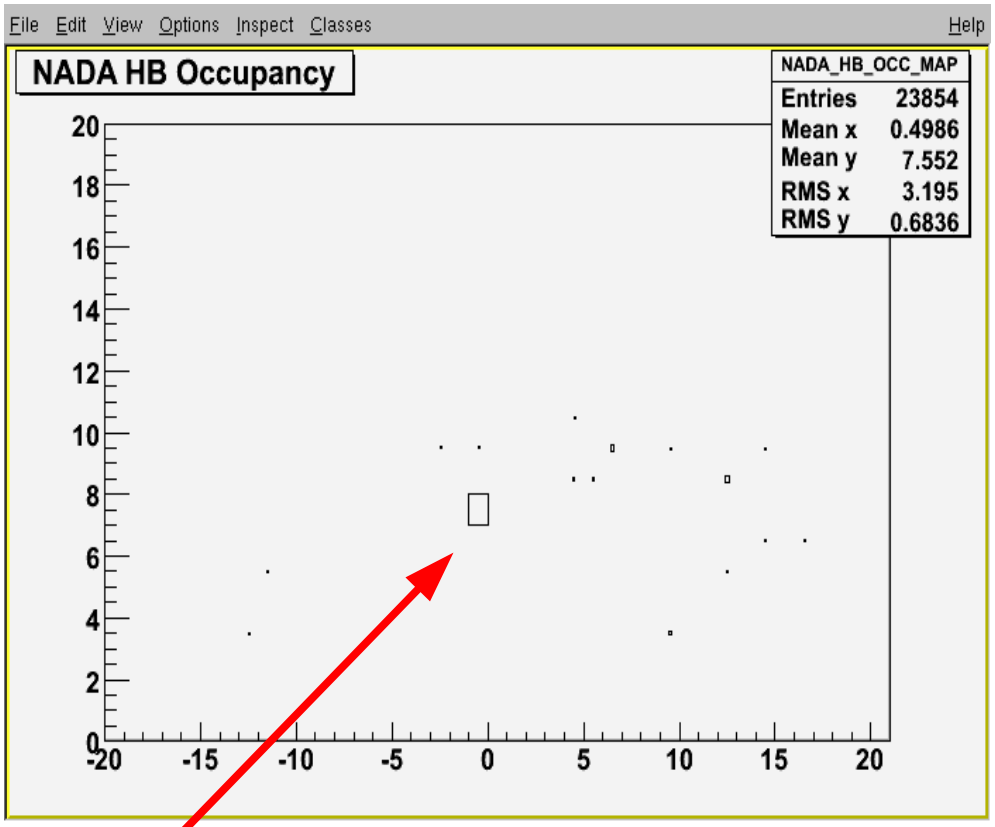
Run 23003



Run 23475

NADA Hot Cell Finder

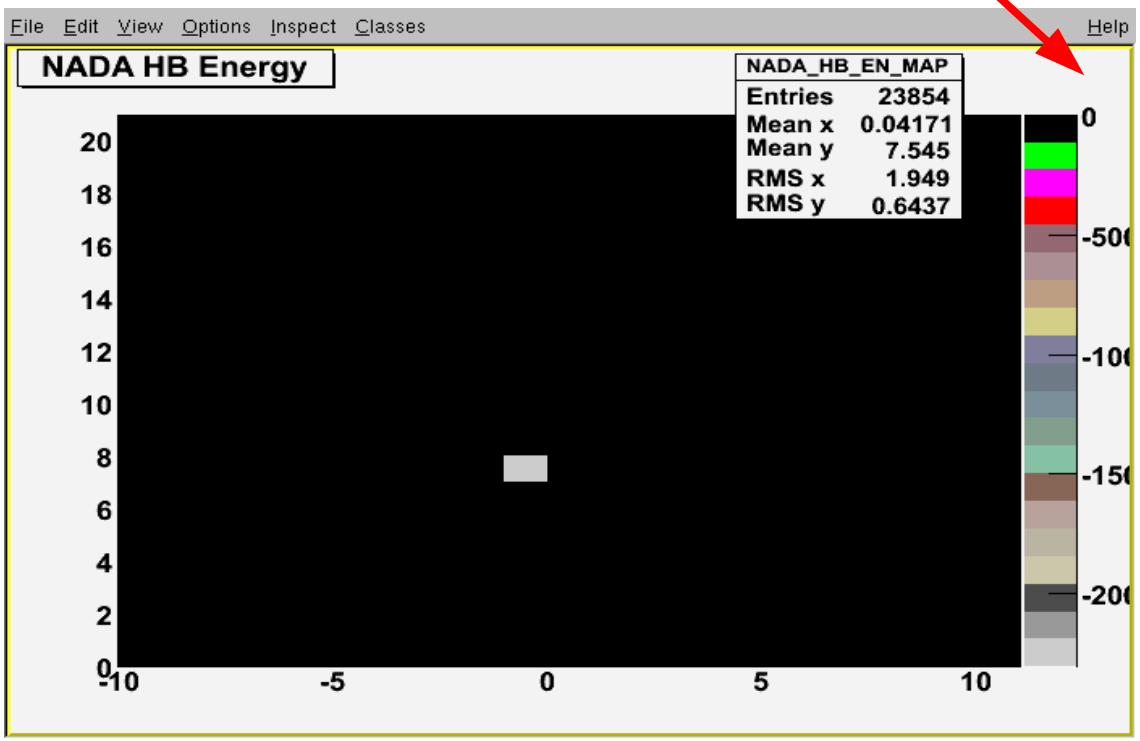


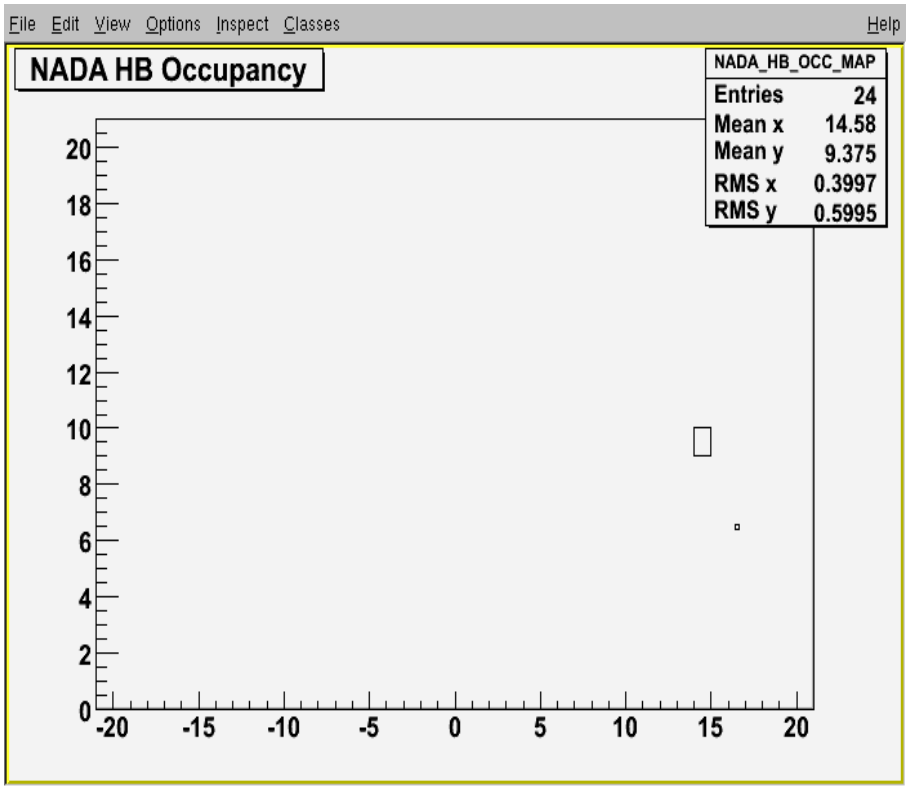


What is this???

Negative-Energy Cell

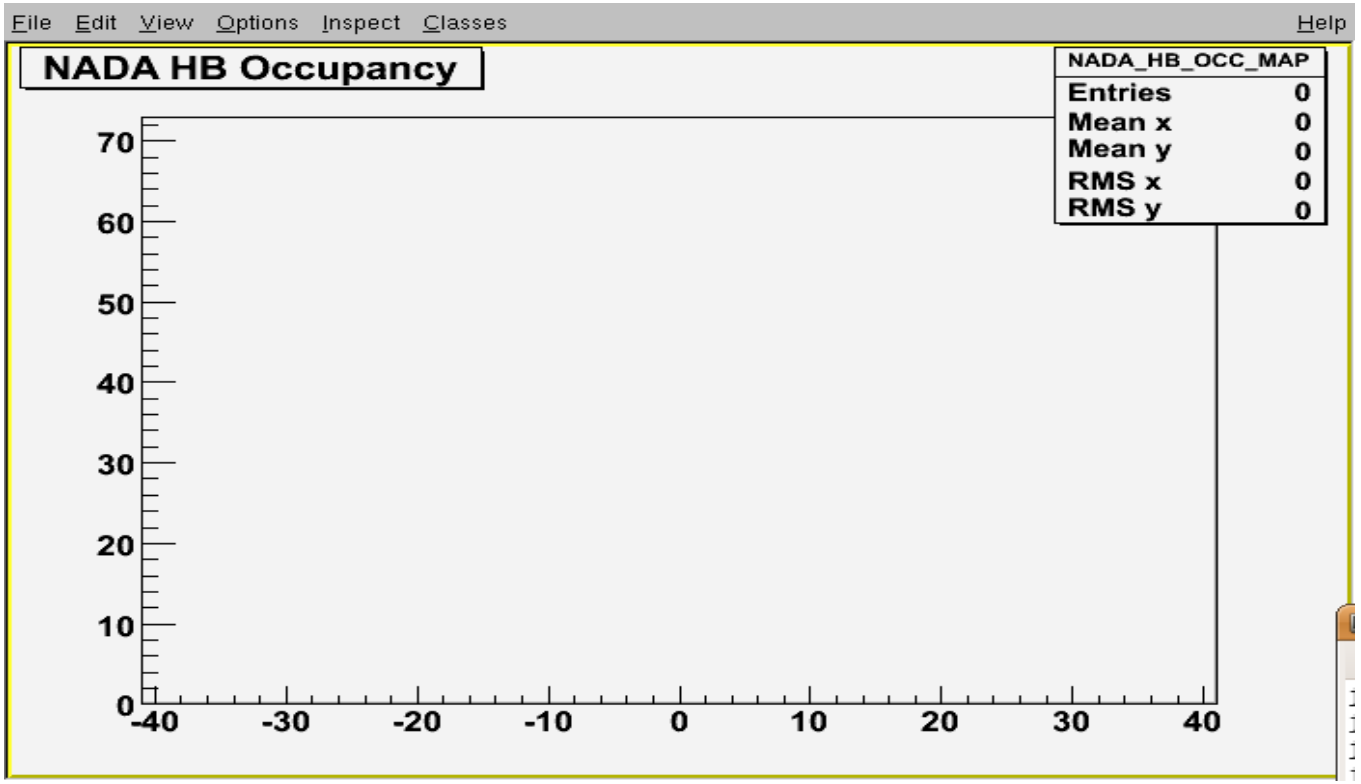
- NADA marks a hot cell if E < 1 GeV





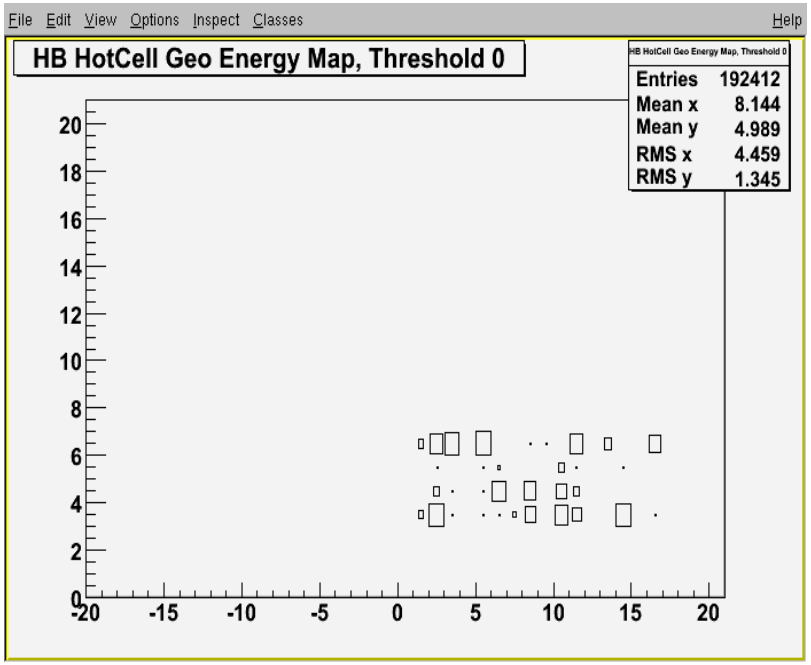
NADA cell occupancy ignoring negative-energy cells

NADA – ignoring negative energy cells

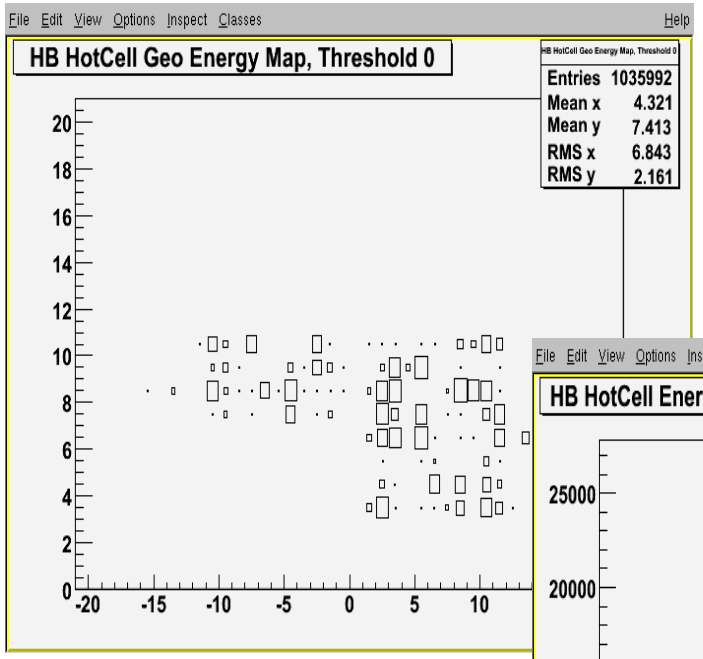


- Run 23003
- Dull plot! -- no hot cells found with NADA algorithm!

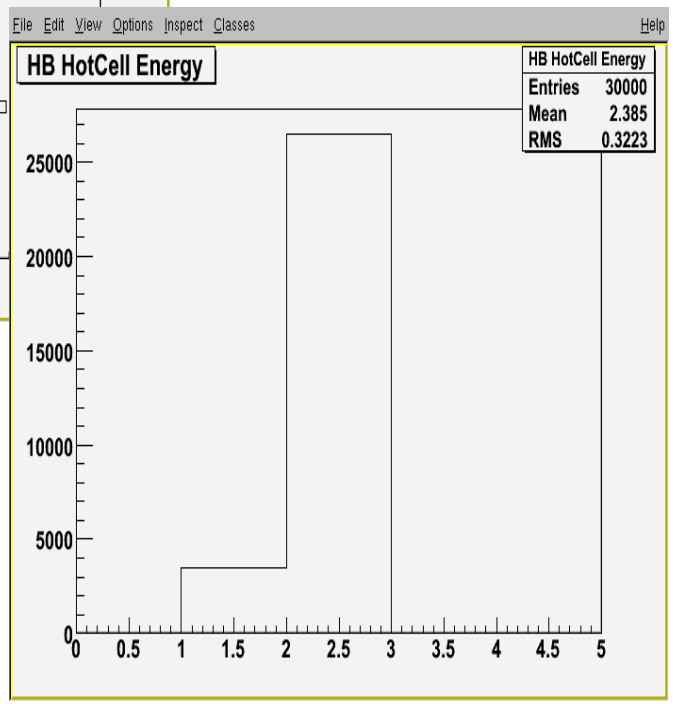
Hot Cell Thresholds in other runs



Run 23061



Run 23375



- Detector hit patterns match logbook description
- No obvious hot cell?

Summary

- Thanks to Wade, hot cell finder can be run on sim files as well as real data
  - Test algorithms on sim
    - Check for bugs (*NADA performance at detector corners/edges*)
    - Look for differences between subdetectors (*varying thresholds*)
  - Tune on data
    - Are results from light leak runs reasonable?
- Add new hot cell finder algorithms?